Name_____

This is Harold Kaplan's third project in SM162. It is handed out Monday 7 March 2005. It is due back Tuesday 22 March 2005, in class on paper, not e-mailed. A project is like an hour test and must be completed without help from anybody except Harold Kaplan. Kaplan will help in class, but not in extra instruction. You may use your own notes and any commercially prepared materials you choose. For each problem, hand in printouts (or pencillings) of program and answer and graph. For approximate solutions of differential equations, explain why you think "N" is big enough. Each answer ought to go on the same paper as its program. The programs ought to have blank lines and indentation to show structure. Use `formatlong()` in the Lua program. Use the "ax" on each program, so it has no lines but those necessary. Using calculus is permitted.

My cousin the historian is interested in the number of Roman laws. In the time of the republic they were all written on only twelve tables, which were fastened onto a wall in Rome so everybody could read them and learn them. In later times they became very numerous, so they had to be written in small handwriting in big books, and only lawyers had the time to read them and learn them. For theoretical reasons he thinks that the rate of increase of Roman laws, in tables per year, is $(\,1+\sqrt{x}\,)p$, where x is the number of tables of Roman law after t years of Roman history, and p is a constant to be determined. Try to find a value for p such that there will be one thousand tables of Roman law after two thousand years of Roman history. Remember to start from twelve tables at zero years.

That is, use Maple and Lua and Gnuplot to experiment with different values of p. Bring in your best value of p, and show a Maple program and slope field and a Lua program and Gnu graph to support your assertion. Have the Lua program print the the last value of the dependent variable x, because a graphical answer is not precise.

Hand this question sheet in with the answer sheets.